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TABLE 4. MEASUREMENTS OF STONE FISHHOOKS

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Hook illustrated	Material	Total length	Width[39]	Thickness	Width of bend	Clearance between point and shank
7,*a*	gray, close-grained basalt	130 mm.	84 mm.	16 mm.	39 mm.	33 mm.
7,*b*	gray, close-grained basalt	71 mm.	50 mm.	12 mm.	21 mm.	12 mm.
7,*c*	gray, close-grained basalt	86 mm.	70 mm.	13 mm.		14 mm.
7,*d*	soft, fine-grained, disintegrated basalt of reddish color	90 mm.	75 mm.	13 mm.	27 mm.	16 mm.
7,*e*	soft, fine-grained basalt, gray with reddish tinges	80 mm.	66 mm.	14 mm.	23 mm.	9 mm.

[39] Width measured from outer edge of shank to outer edge of point limb.

The first stage in the manufacture of a stone hook is the choice of suitable material. The piece of basalt must be not only close-grained and free from flaws but, as far as possible, of convenient form and thickness to obviate the labor of reducing an unwieldy mass. The second stage consists in giving the stone the general outline of a hook, by coarse chipping followed by grinding. When the bulk of the material has been reduced, sometimes even before, the stone within the inner curve is removed by drilling a large hole through the stone and then enlarging it by drilling other holes on the border of the first (fig. 8, *d*). The holes are generally drilled from one side and then broken through from the other side when the hole is near completion. Thus the perforation is larger than it would be if the hole had been pierced from one side only. Judging from the shallow, [401] wide depressions left on specimens in the first stage of drilling, the tool used has a broad working end. It is probably a drill of the general Polynesian type: a spindle with some sort of flywheel turned with a cord. Sand mixed with water is undoubtedly the grinding agent. In the specimens at hand, the upper diameter of the hole is between 19 mm. and 25 mm., but these figures do not give the exact size of the drill bit, since the unsteady movements of the drill tend to enlarge the hole. An unfinished fishhook that I procured on Easter Island was fashioned by drilling a cluster of small holes in the center (fig. 8, *g*). Simultaneous drilling and grinding of the stone explain why some unfinished hooks have the outside edges so perfectly shaped and worked.

The pattern of the stone hooks is uniform throughout, the principal variations being in thickness at the bend and in the distance between the point and the shank. Most of the fishhooks have a continuous curve, but in one specimen (fig. 7, *b*) the limb from the bend to the point is almost straight. The shank is topped by a knob or projecting ridge with transverse grooves. A depression in the knob divides it into two unequal parts—one rounded, and the other small and sharp (fig. 7, *a*) which is generally toward the point. Below the ridge there is a recess, the inner margin of which is sometimes

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316 A visit to the quarries of the western slope reveals a helter-skelter succession of unfinished statues, of artificial caves or niches from which statues
532 have been removed or are in the process of being disengaged, of narrow passages leading to an image ready to be launched, or to some incomplete image. In the quarries are 157 statues in different stages of completion. So many images are concentrated in a small area that there is hardly a place where the eye does not discover the outline of one of them, often in the most unexpected positions. Some statues are horizontal, others with the head toward either the foot or the top of the mountain. At each end of the quarry there is a series of images lying horizontally, one above another with heads and feet alternating on each side.

532 Several unfinished statues were executed in the least accessible places as if the sculptors had been afraid to waste any space. One of the largest images in the quarry is stranded with the head broken off in a passage formed by the removal of other statues. The accident probably occurred when the bed of earth on which the statue rested was washed away by rain. The number of empty quarries from which statues were taken is far smaller than the number of the statues on the ahus. Numerous niches were probably destroyed when new statues were to be carved.

The number of statues in process of construction is so great that it is difficult to believe that they were all being carved at the same time. The number of experts could hardly have sufficed for the task. Many statues were evidently left unfinished because of flaws in the material. Sometimes the lapilli extracted from the tuff left depressions on the surface which would have spoiled the finished statue.

A close study of a quarry reveals the technique of ancient carvers. After finding a satisfactory spur or ledge, the sculptor first shaped the face, next the front of the body, then the sides, and last of all the back. I know of only one statue which was detached before the details had been carved. Two unfinished statues show that at a certain stage the image was undermined from each side, leaving the statue attached to the rock below by a narrow flange (pl. 5, *C*). When the workers were ready to cut the flange they placed stone
●[401] wedges under the statue to support it and to prevent its cracking. Three finished statues rest on such wedges. When necessary passages were cut in the rock on both sides of the statue where the carvers stood to work. When the statue was to be extracted from a perpendicular wall, a cave was hollowed around the statue.

The manner in which the rock was carved is clear. Around the statues,
532 and particularly at the foot of the slope where they were washed by rainfall
412 and landslides, are found blunted stone mallets made of lapilli (p. 278). These mallets, held in the hand, were well adapted to their purpose. The carving was probably completed with adzes though there are few discarded adz blades

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532 features at the end of the ceremonial staffs (*ua*) or on the wooden paddles (*rapa*).

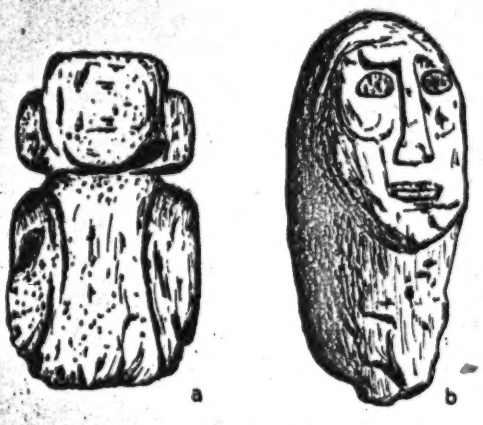

FIGURE 54.—Small stone images: *a*, statue 210 mm. high, maximum width 120 mm. (Trocadero Mus.); *b*, stone head, probably from a pillar decorating entrance to a house (Mus. f. Völkerkunde, Vienna, 20055).

STONE HEADDRESSES FOR STATUES

The heads of many of the statues on the terraces once bore a big cylinder (*hau hitirau moai*), made of red vesicular tuff (pl. 6, *C*). Their dimensions range from 1.2 meters to 2 meters in height and from 1.6 to 2.7 meters in diameter. The top of some cylinders has a knob or boss the length of which ranges from 15 to 60 cm. The lower surface has a slight depression which fitted over the top of the image's head. This concavity is not in the center, but near one side so that the cylinder projected over the eyes (see 130, Atlas, pl. 11). Such a disposition was observed by Gonzalez' men (90, p. 94):

> The diameter of the crown is much greater than that of the head on which it rests, and its lower edge projects greatly beyond the forehead of the figure; a position which excites wonder that it does not fall. I was able to clear up this difficulty on making an examination of another smaller statue from whose head there projected a kind of tenon, constructed to fit into a sort of slot or mortice corresponding to it in the crown; so that by this device the latter is sustained notwithstanding its overlapping the forehead.

Roggeveen (186, p. 16) mistook the hats for baskets, but he observed "flints painted white" heaped on them. These white stones were observed by the Spaniards under Gonzalez (90, p. 93) who mistook them for bones and by Du Petit-Thouars (65, vol. 2, p. 225). Natives remember that stones were used as wedges to keep the images in place (194, p. 199).

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Transportation of Stone Statues

Modern natives are unable to explain the methods used by their ancestors for transporting the stone images. This break in the oral tradition is perhaps ancient, for soon after first European contact natives had to resort to legends to satisfy those who inquired about the subject. They told Roussel (190, p. 498) that a chief endowed with power (mana) had ordered the statues to walk. "Hearing his words, all the statues set out and picked out the places which were the most convenient to them." Palmer (171, p. 181), who probably heard this legend from Roussel, says that this great chief was Tukuiu (Tuu-ko-ihu). According to Zumbohm (230, vol. 6, p. 128) the mythical being whose power dispersed the statues from the quarry to the ahus was the god Makemake. In a later version (37, p. 29), this achievement is attributed to the priests (*ivi-atua*) who moved the statues at the request of those who wanted them on their family ahus. The huge blocks walked for a distance and then stopped. Each day the priests repeated the charms until the images had reached the spot for which they were destined.

More technical traditions about transportation are rare. A native called Haunoko told Jaussen (115, p. 245) that round boulders were put under the images and that the natives pushed, dragged, and rolled them to the place of destination. Geiseler (87, p. 12) was shown some holes along the edge of Rano-raraku crater in which rope tenders stood while paying out rope as the statues slid down hill; they made turns around projecting blocks when the statue had to be belayed. The image was dropped into a hole which had been dug for it.

Routledge (194, p. 189) noticed many stones behind the statues, evidently used when the images were erected. Some statues were left standing at an angle. The natives remember that the hats were put on the heads of statues by erecting piles of stones against an image and then rolling the cylinders over the stones. A similar method was used in placing large stones in Marquesan structures (141, p. 8). I was told that levers (*akaue*) were used for transport and that taro and sweet potatoes were put under the statue for lubrication.

The weight of the Easter Island images has usually been over-estimated. Professor Delacroix, Director of the Laboratory of Geology in Paris, has kindly calculated for me the specific weight of the Rano-raraku tuff. The density of this rock is 2.48. Taking this figure as a basis, Dr. C. K. Wentworth, Associate in Geology at Bishop Museum, has estimated the weight of the average statue transported from the quarry to the ahu. Statues 4 or 5 meters tall weigh at most about 4 or 5 tons. I doubt whether the weight of any of the giant statues which stand near the quarry exceeds 30 tons.

Other Polynesians have carried weights as heavy as the Easter Island